



# **Armed Forces College of Medicine AFCM**



# **Rectus sheath, Inguinal Canal & Hernia**

**By**

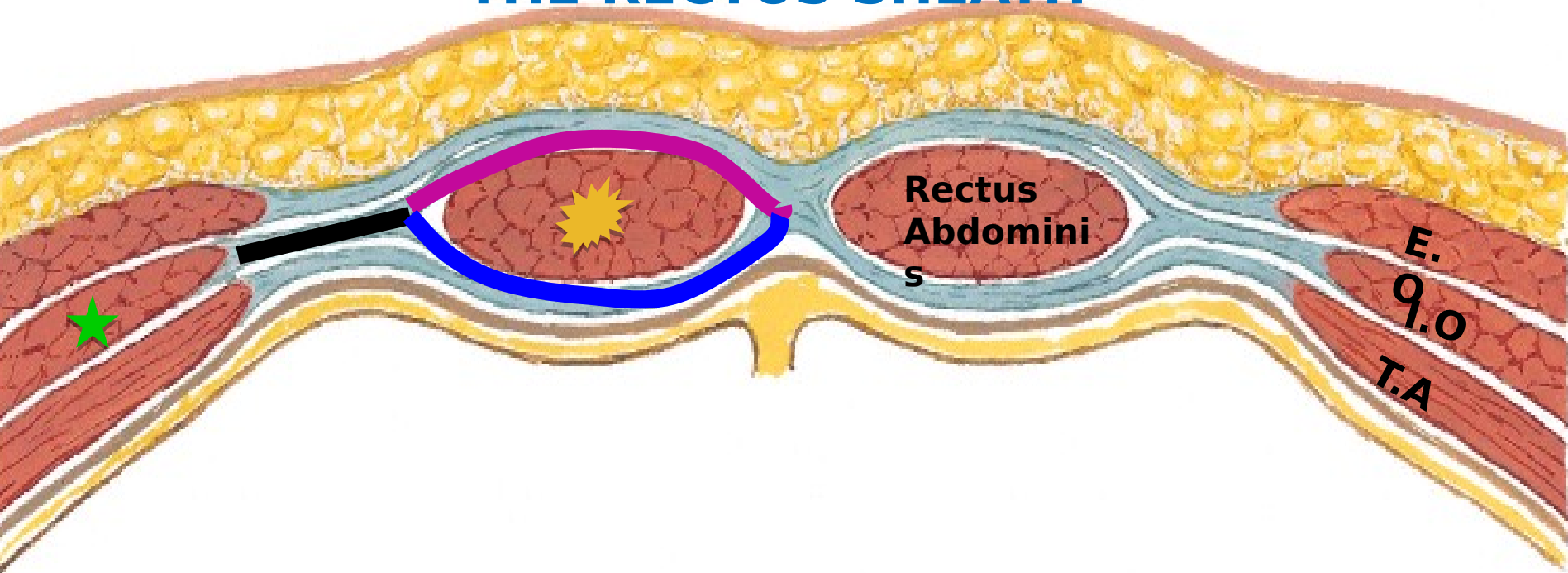
**Prof Azza Kamal**

# ILO's

- **By the end of this lecture, each student should be able to :**

1. Describe formation of the rectal sheath and its contents
2. Describe the inguinal canal, its length, walls & contents.
3. Describe the superficial & deep inguinal rings.
4. Differentiate between direct & indirect inguinal hernias.

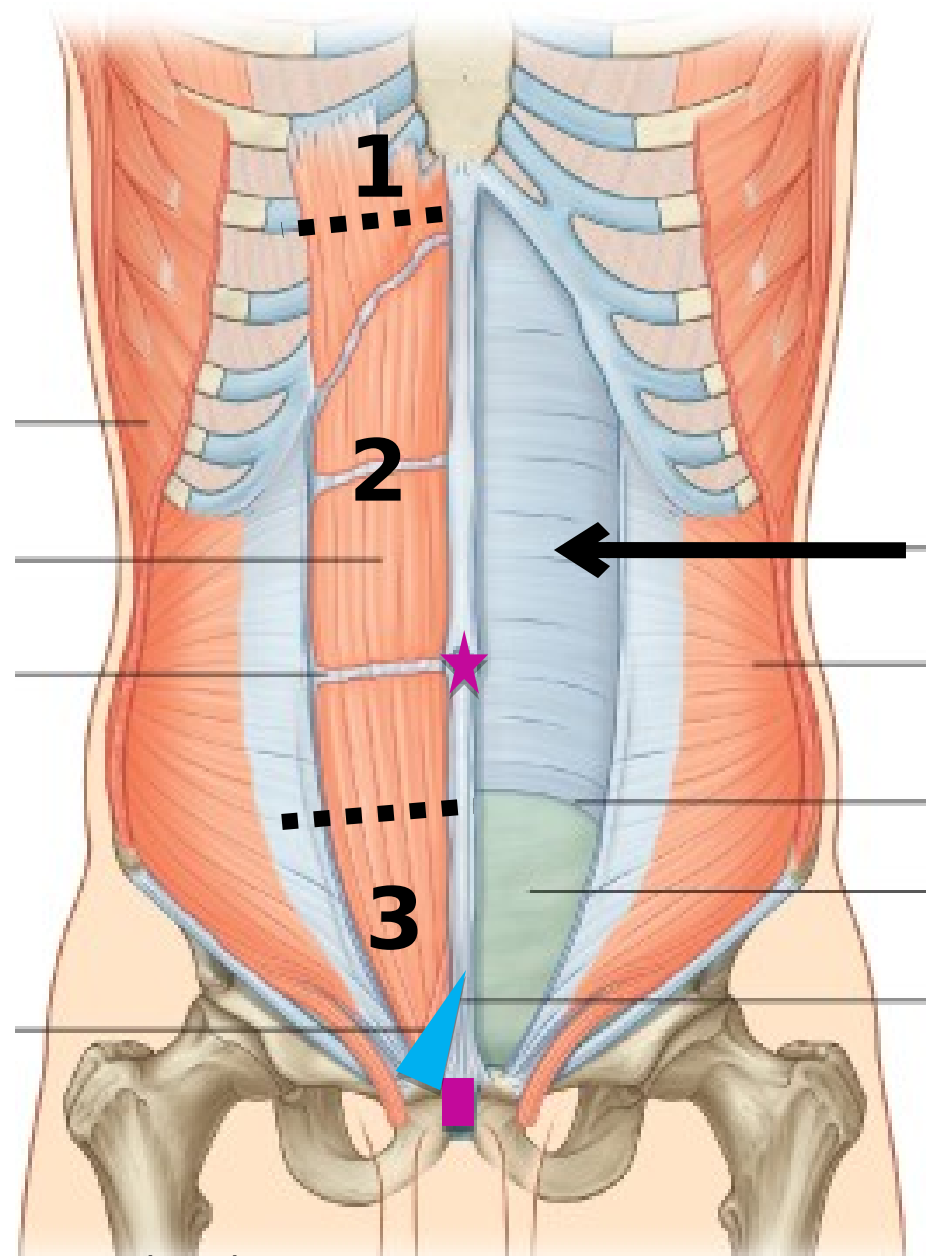
# THE RECTUS SHEATH



- **The aponeurosis of internal oblique muscle splits at the lateral margin of rectus abdominis into an anterior & a posterior layer to enclose the muscle. This is the main event leading to the formation of the rectus sheath.**

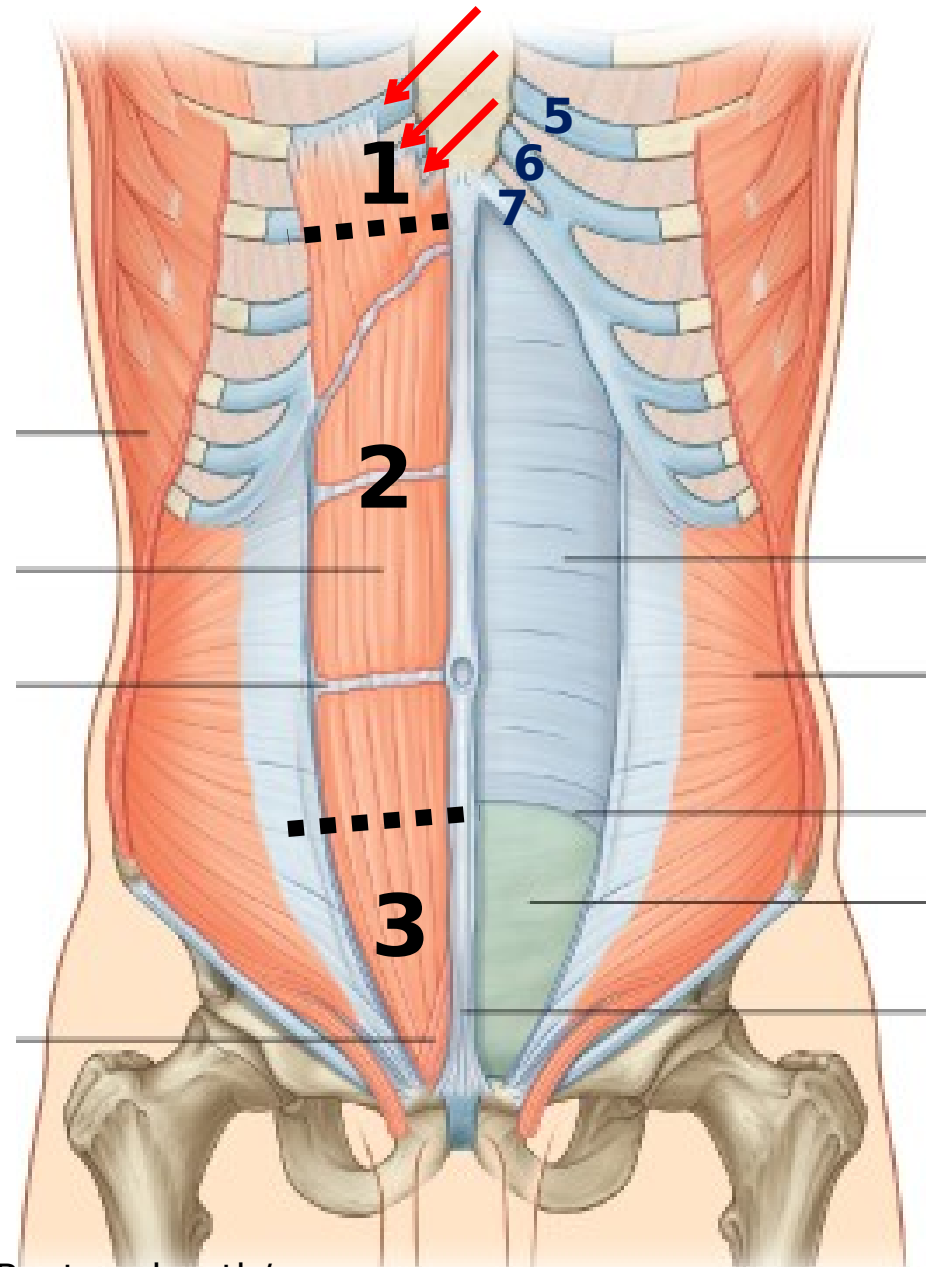
# RECTUS SHEATH

- An aponeurotic tendinous sheath enclosing the rectus abdominis and pyramidalis muscles.
- **3 zones:**
  - 1.** Above costal margin.
  - 2.** Between costal margin & a line midway bet. umbilicus & symphysis pubis.
  - 3.** Below the midway level till symphysis pubis



# ZONE 1

- **Ant. Wall:**  
**External oblique aponeurosis**
- **Post. Wall:**  
**No posterior wall** □ **only costal cartilages 5,6,7**  
**(insertion of**



# ZONE 2

- Anterior wall:

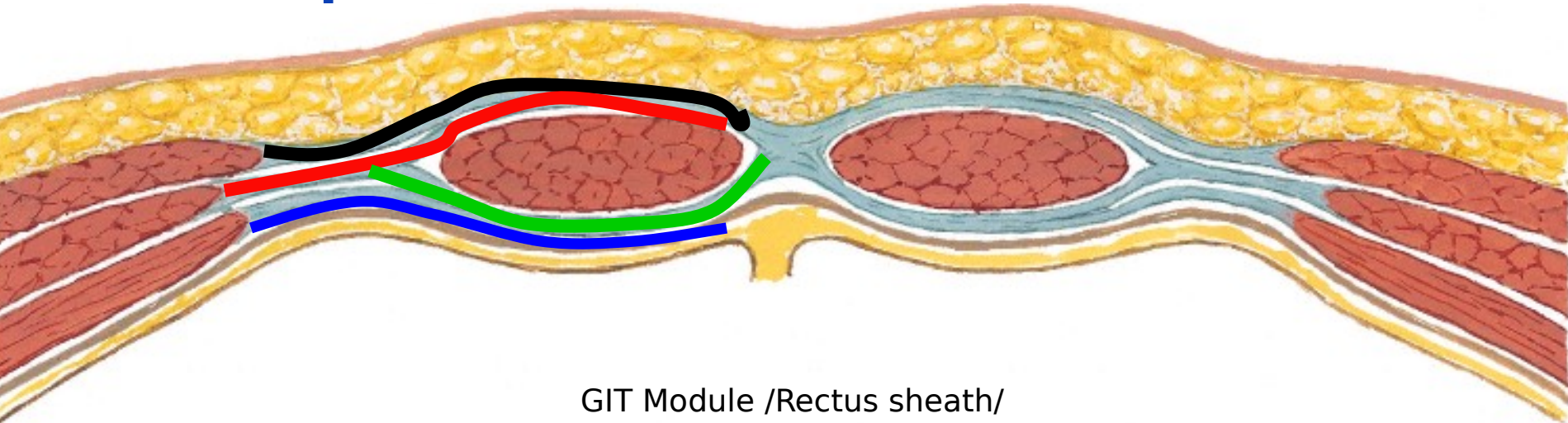
**Aponeurosis of the external oblique**

**Anterior layer of the aponeurosis of internal oblique**

- Posterior wall:

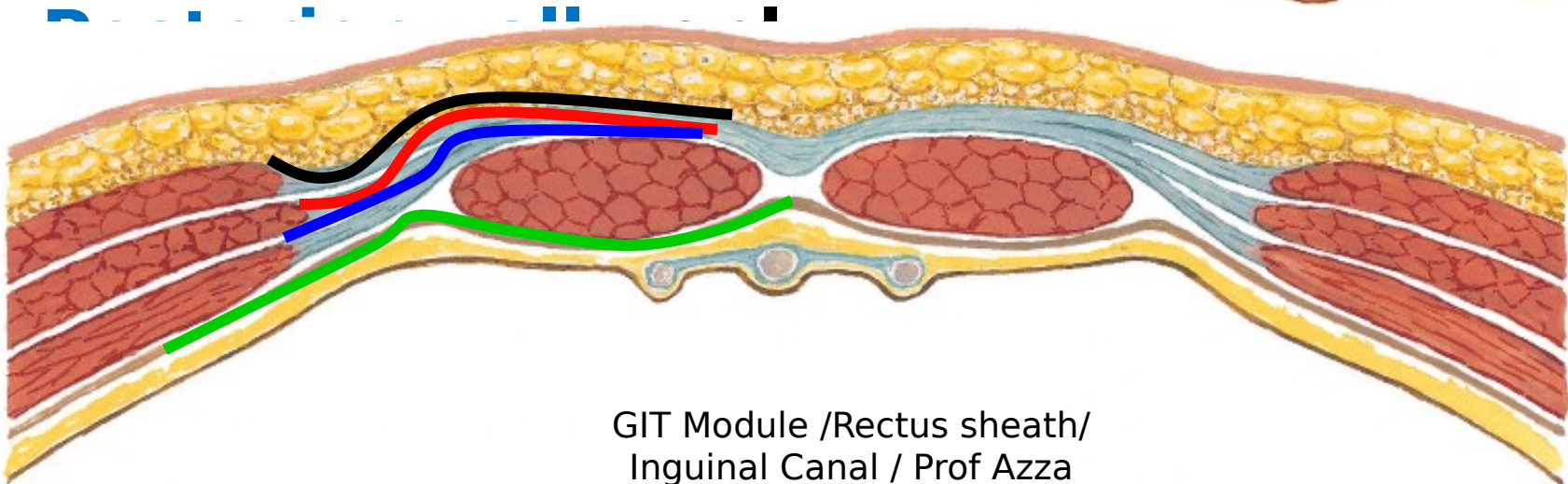
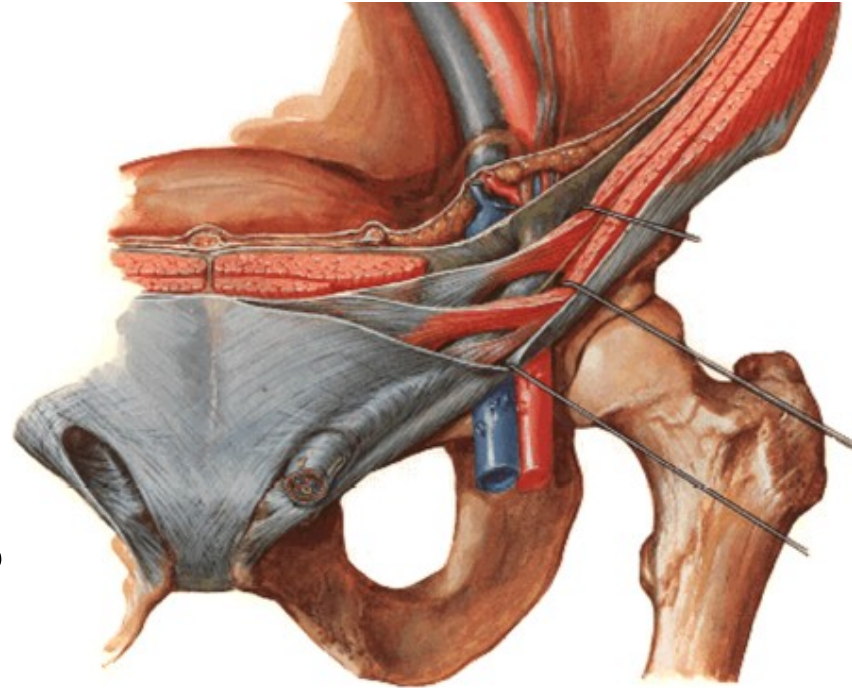
**Posterior layer of the aponeurosis of internal oblique**

**The aponeurosis of the transversus**

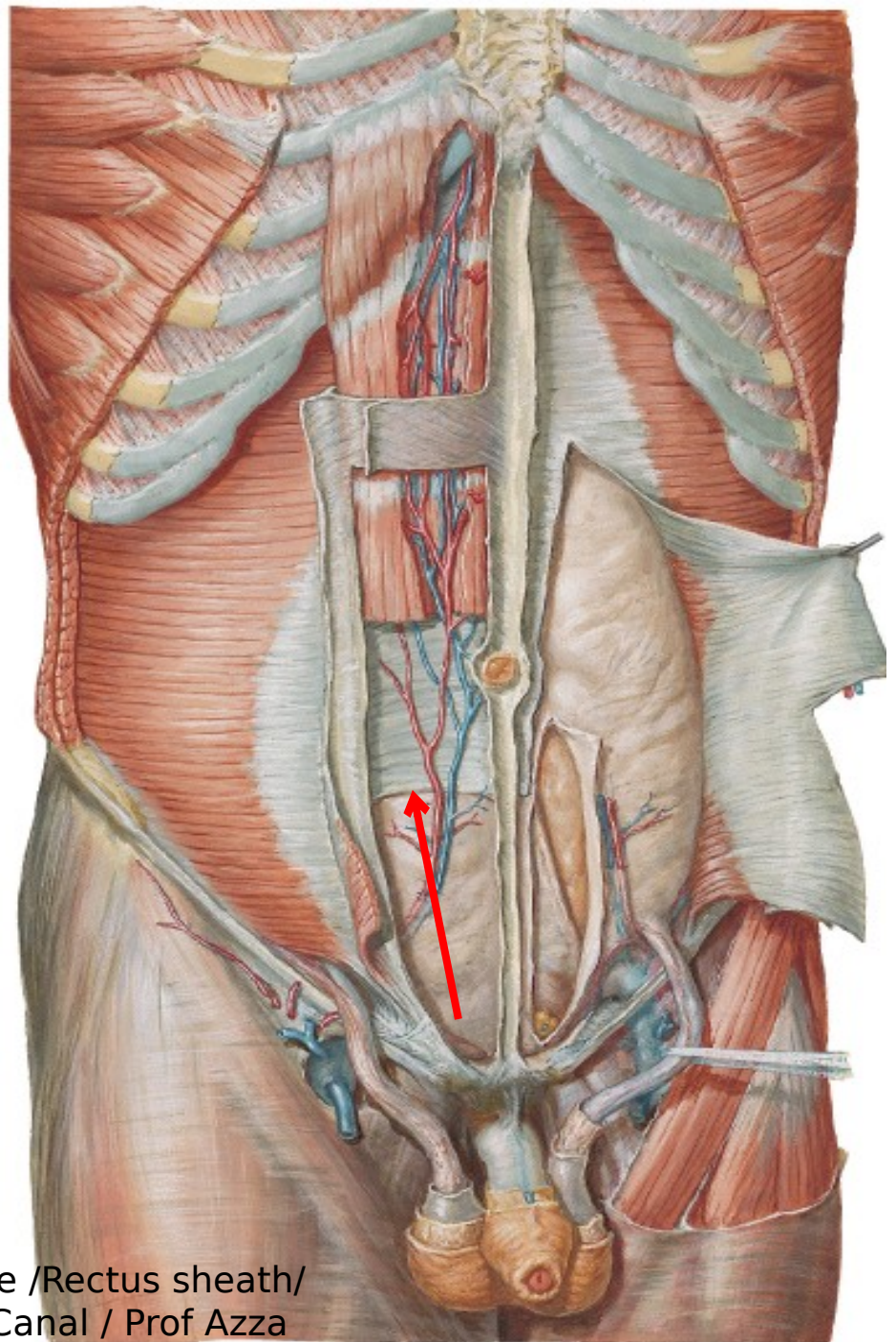


# ZONE 3

- All 3 aponeuroses move anterior to the rectus muscle.
- Anterior wall :  
aponeuroses of the external oblique, the internal oblique & the transversus abdominis muscles.



**The aponeurotic post. wall of rectus sheath ends at a line midway between umbilicus & symp. pubis by forming an arched border called arcuate line**



## \* Structure of each part of the sheath:

### (1) 1st part:

- post. wall : is formed by costal cartilages only.
- ant. wall : is formed by the ext. oblique aponeurosis

### (2) 2nd Part:

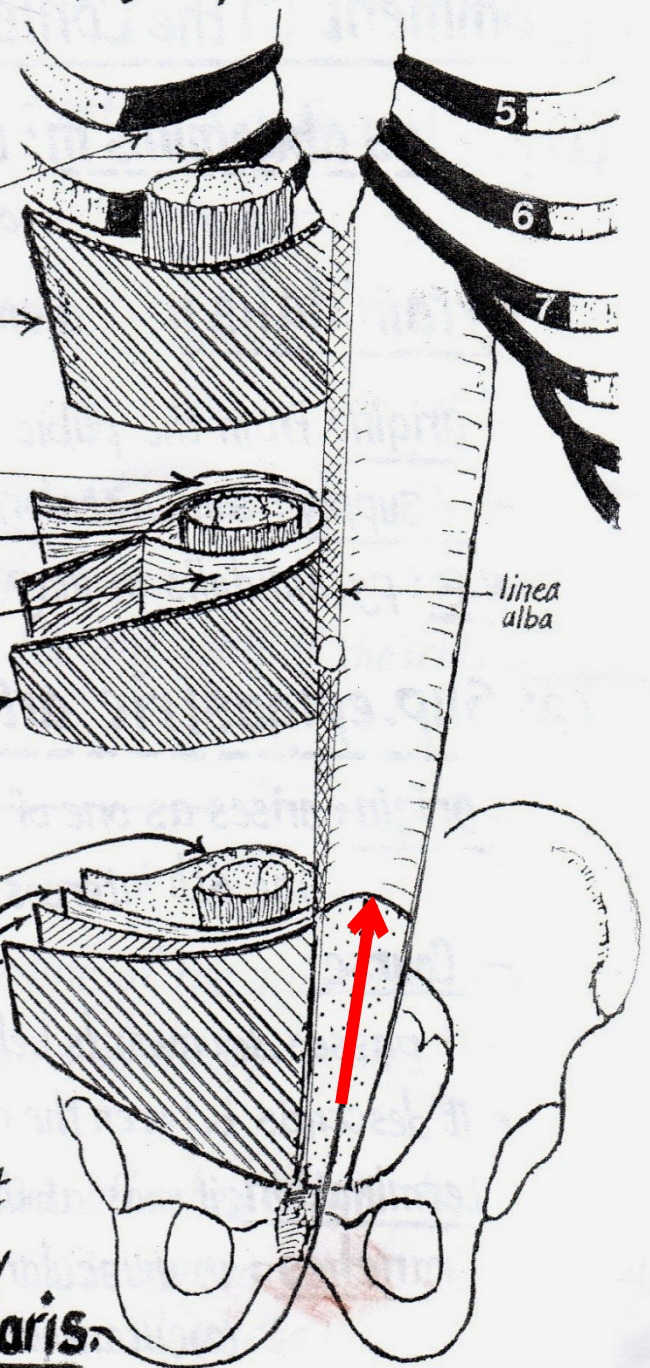
- post. wall formed by
  - (1) transversus aponeurosis
  - (2) post. lamella of int. oblique m.

- ant. wall " "
  - (1) ant. lamella of int. oblique
  - (2) ext. oblique aponeurosis

### (3) 3rd Part:

- post. wall : is deficient (formed by fascia transversalis)
- ant. wall : formed by the aponeuroses of the 3 muscles (ext. oblique, int. oblique & transversus abd. which all pass in front of the rectus muscle).

N.B : the aponeurotic post. wall of the rectus sheath ends at the line  $\frac{1}{2}$  way between umbilicus & symphysis pubis by forming an arched border called linea semicircularis or arcuate line.



# CONTENTS

2 muscles

2 arteries

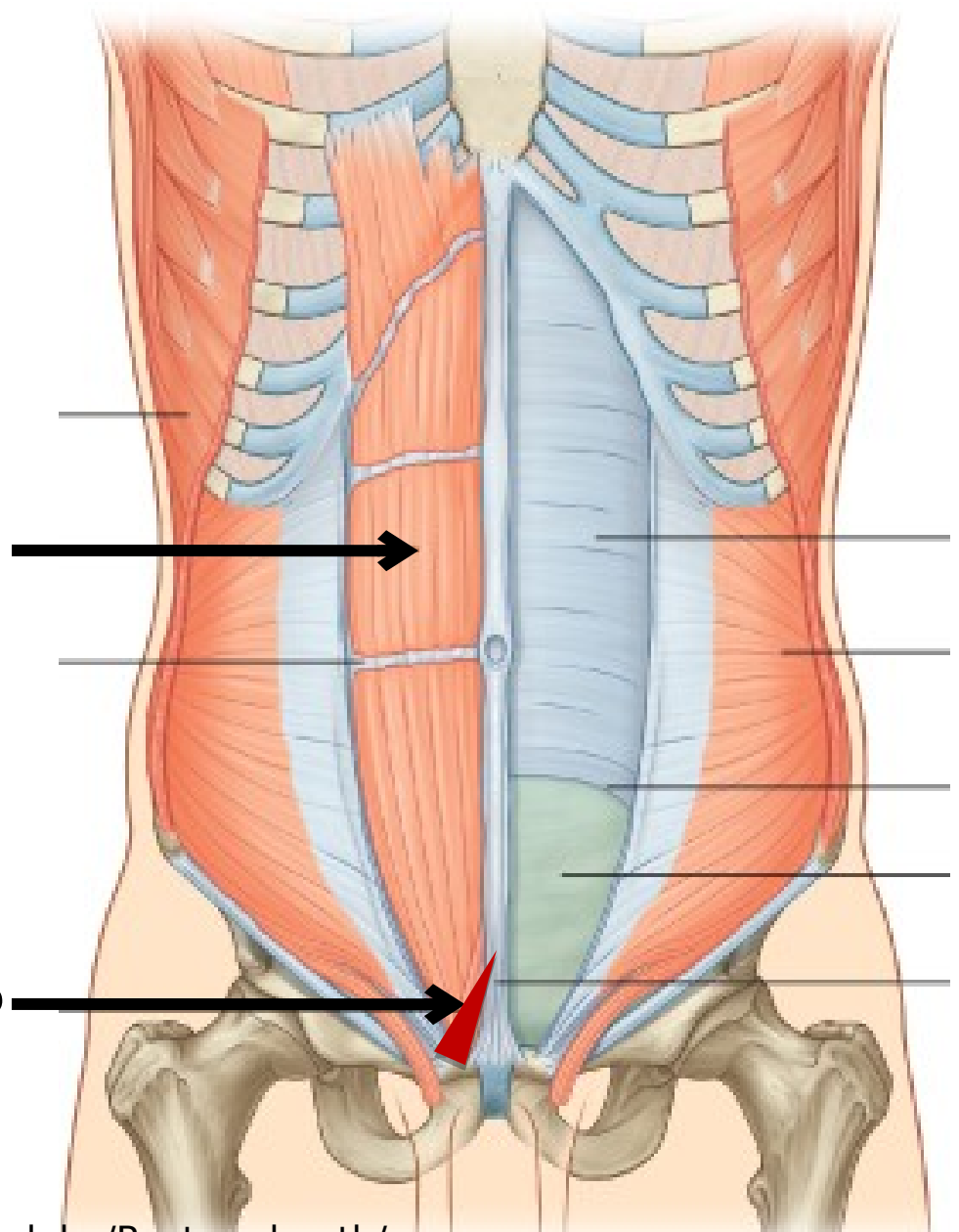
2 veins

6 nerves

## 2 muscles:

1) Rectus abdominis

2) Pyramidalis



**2 arteries:**

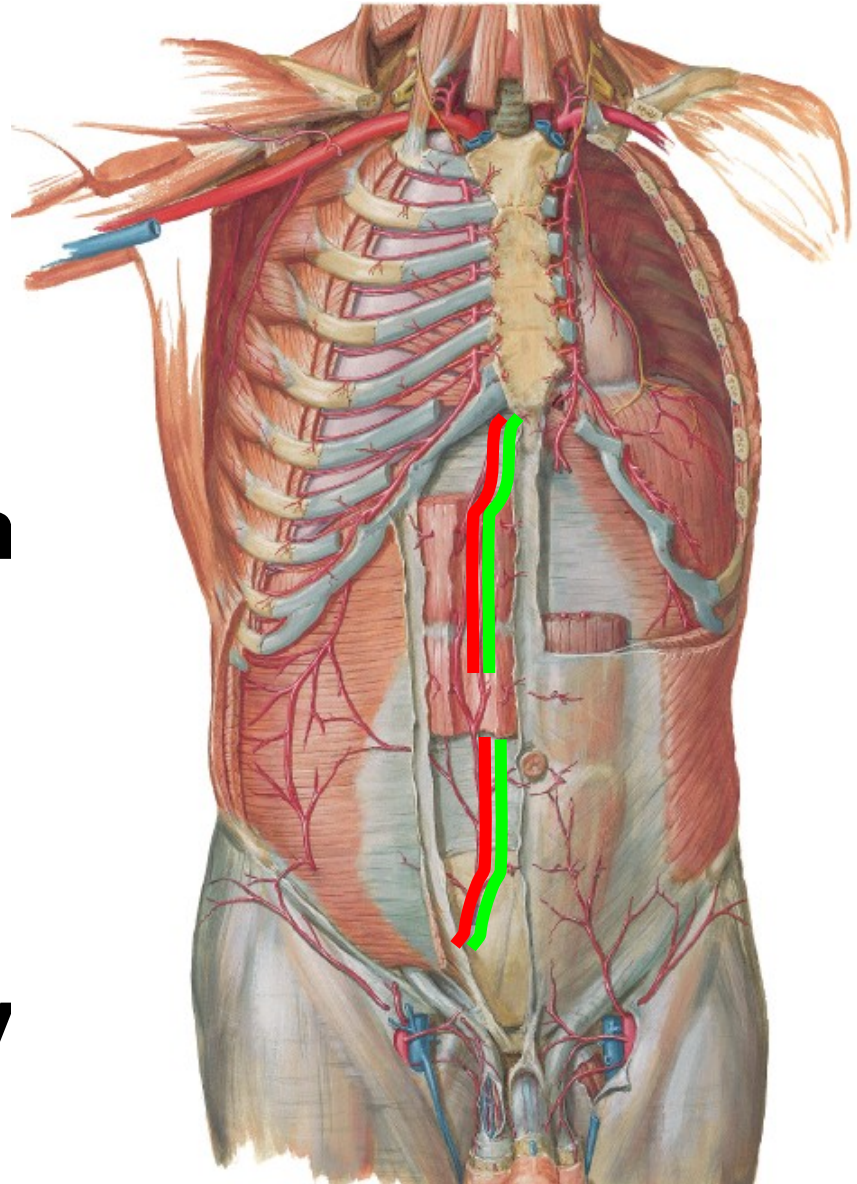
**Sup. Epigastric  
a.**

**Inf. Epigastric a**

**2 veins:**

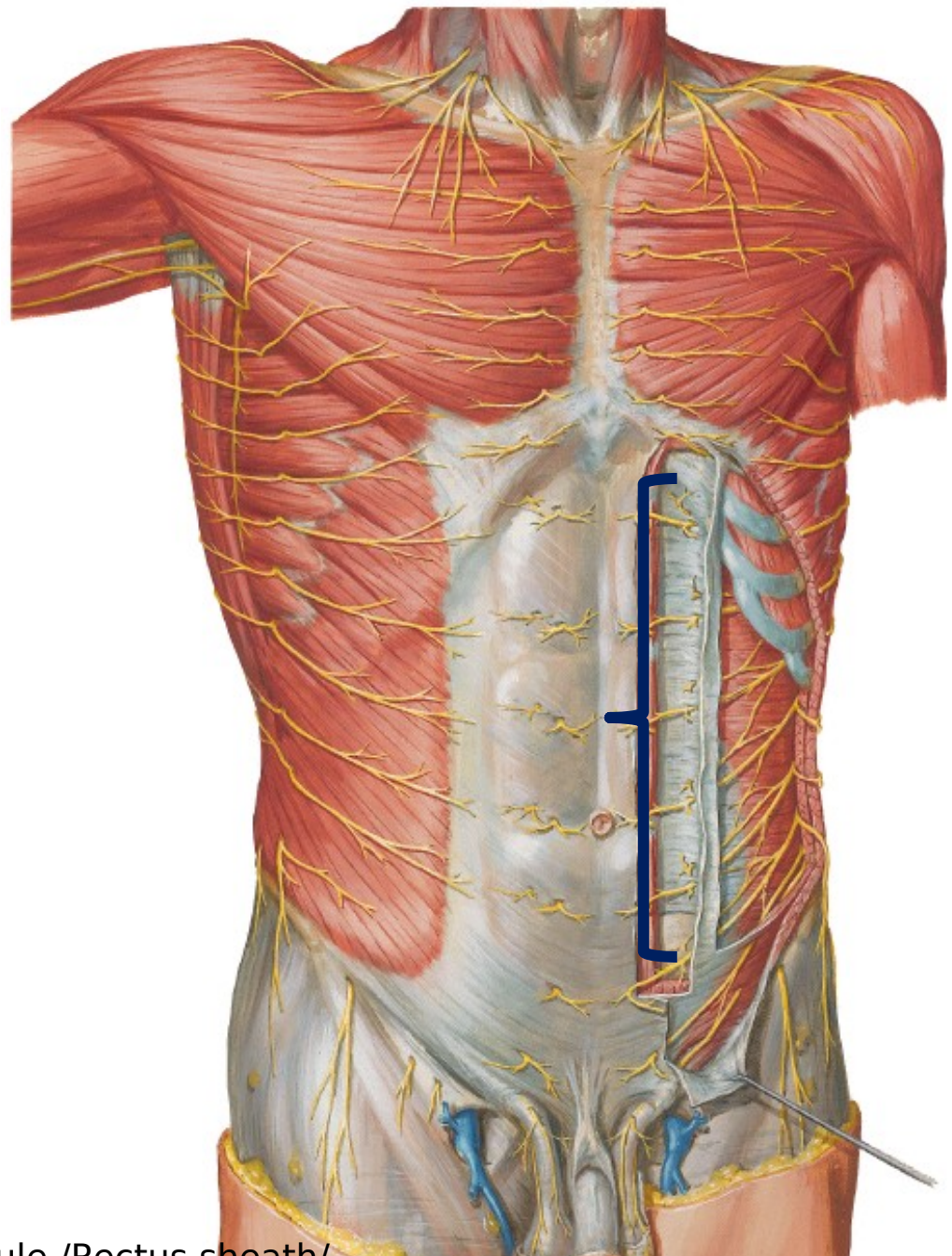
**Sup. Epigastric  
v.**

**Inf. Epigastric v**

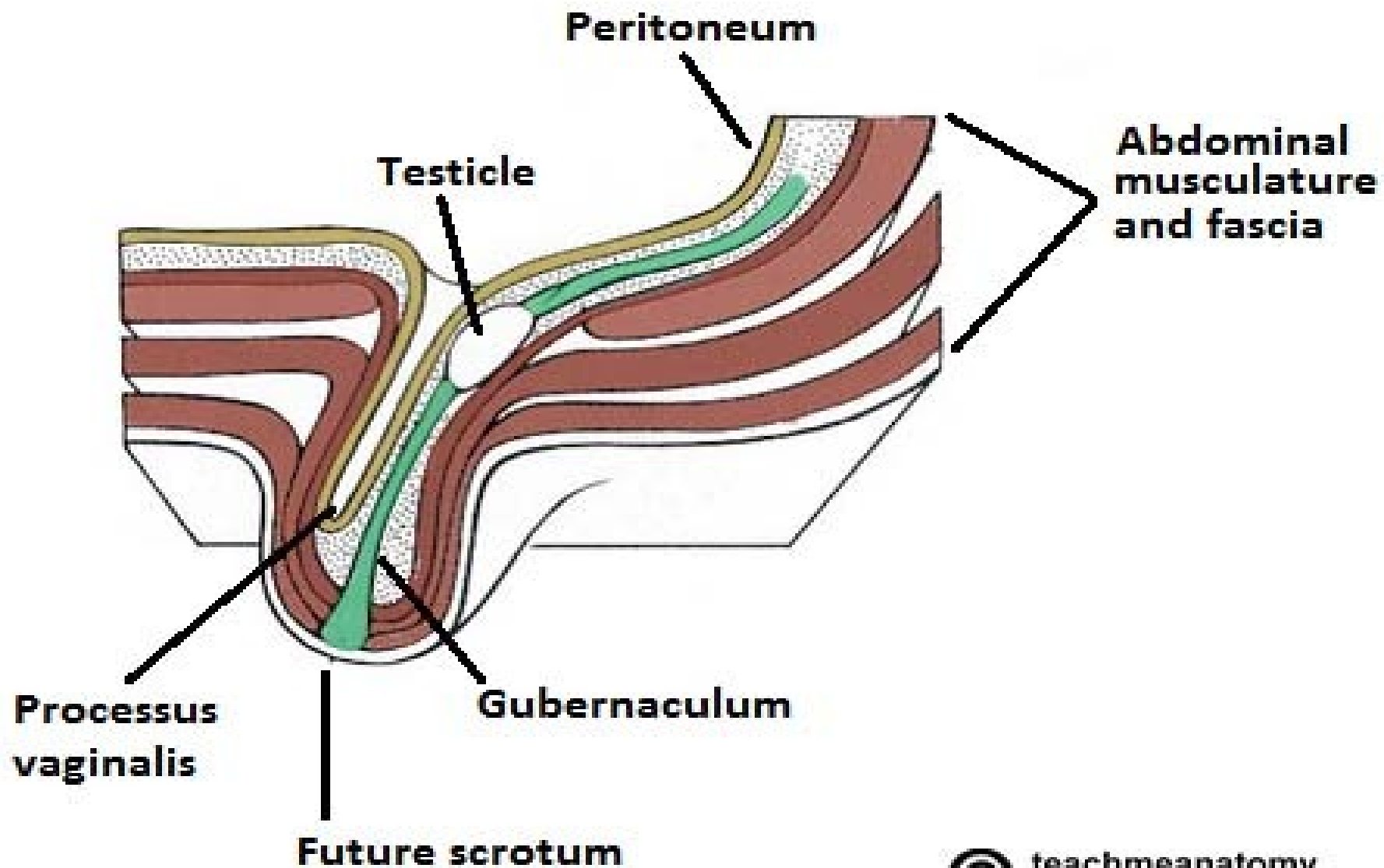


**Nerves:**

**Termination of  
lower 5  
intercostal +  
subcostal nerve**

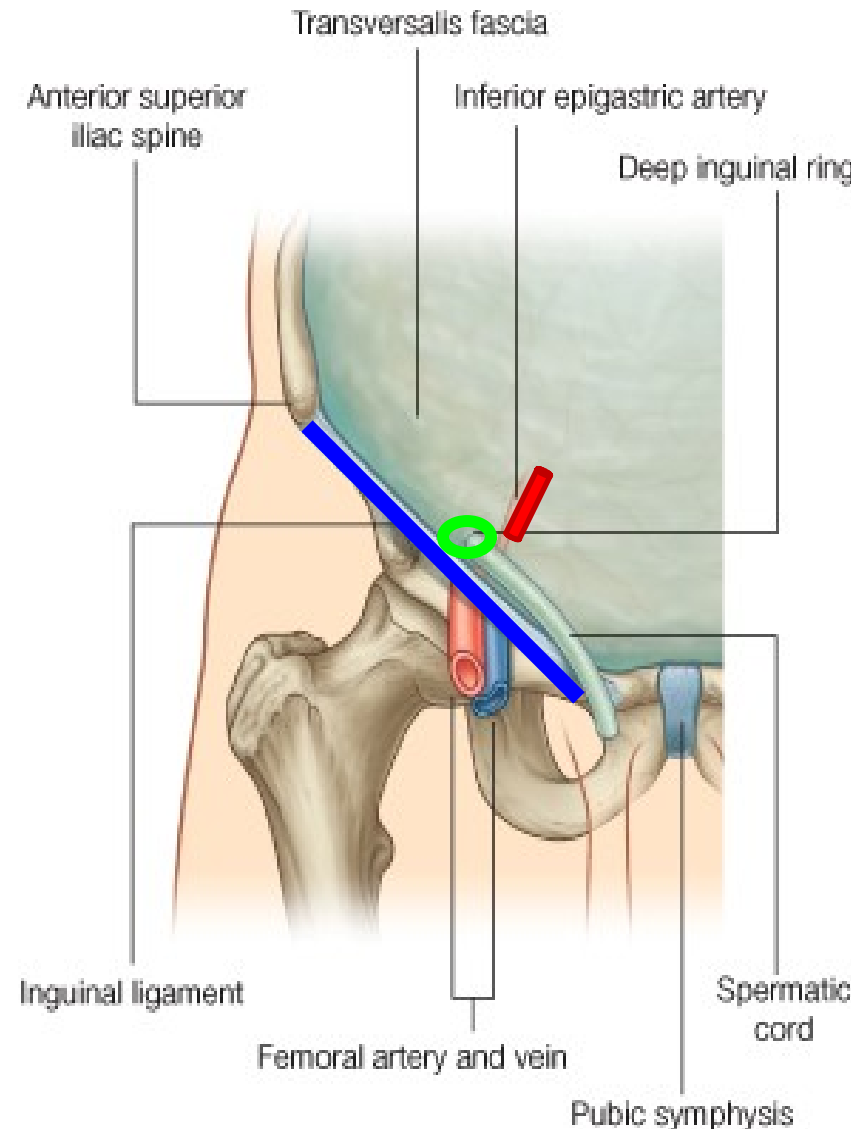


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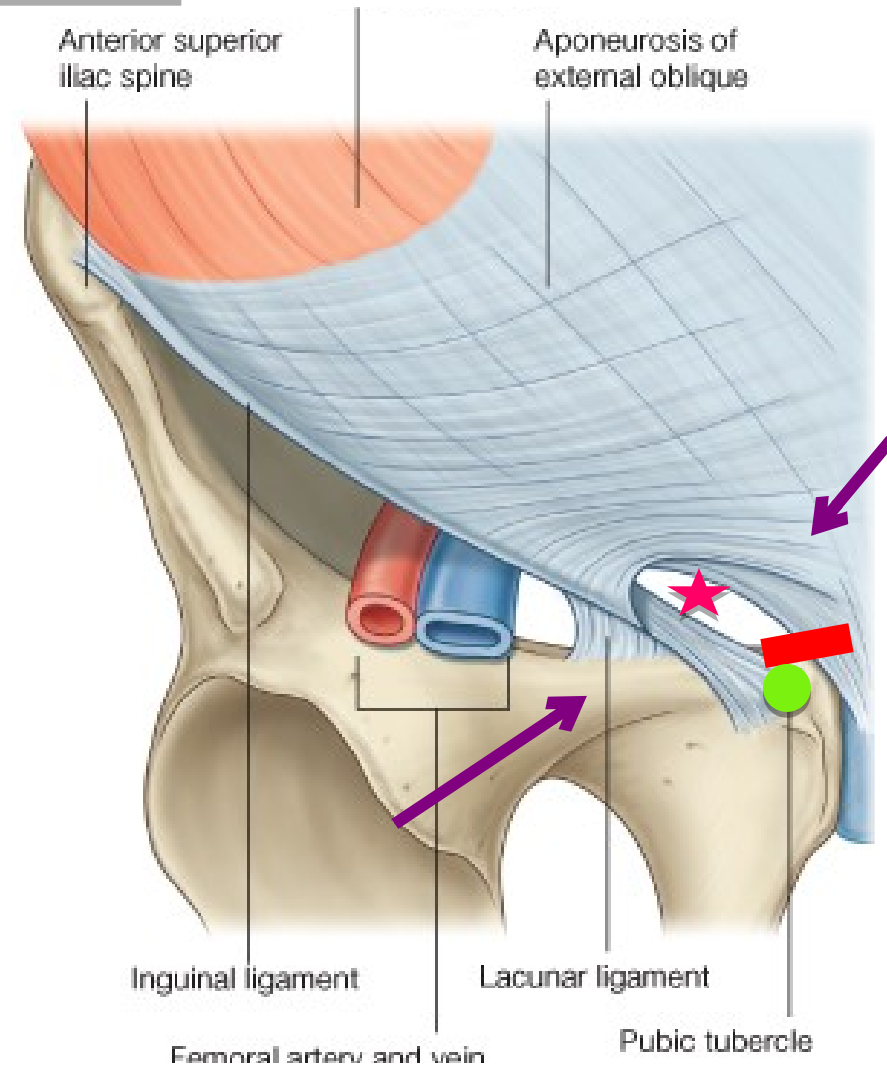
# Deep inguinal ring:

- **Def.:** Oval opening in fascia transversalis
- **Site:**  $\frac{1}{2}$  inch above midpoint of inguinal ligament
- **Relations:**
- It lies **lateral to the inferior epigastric vessels.**



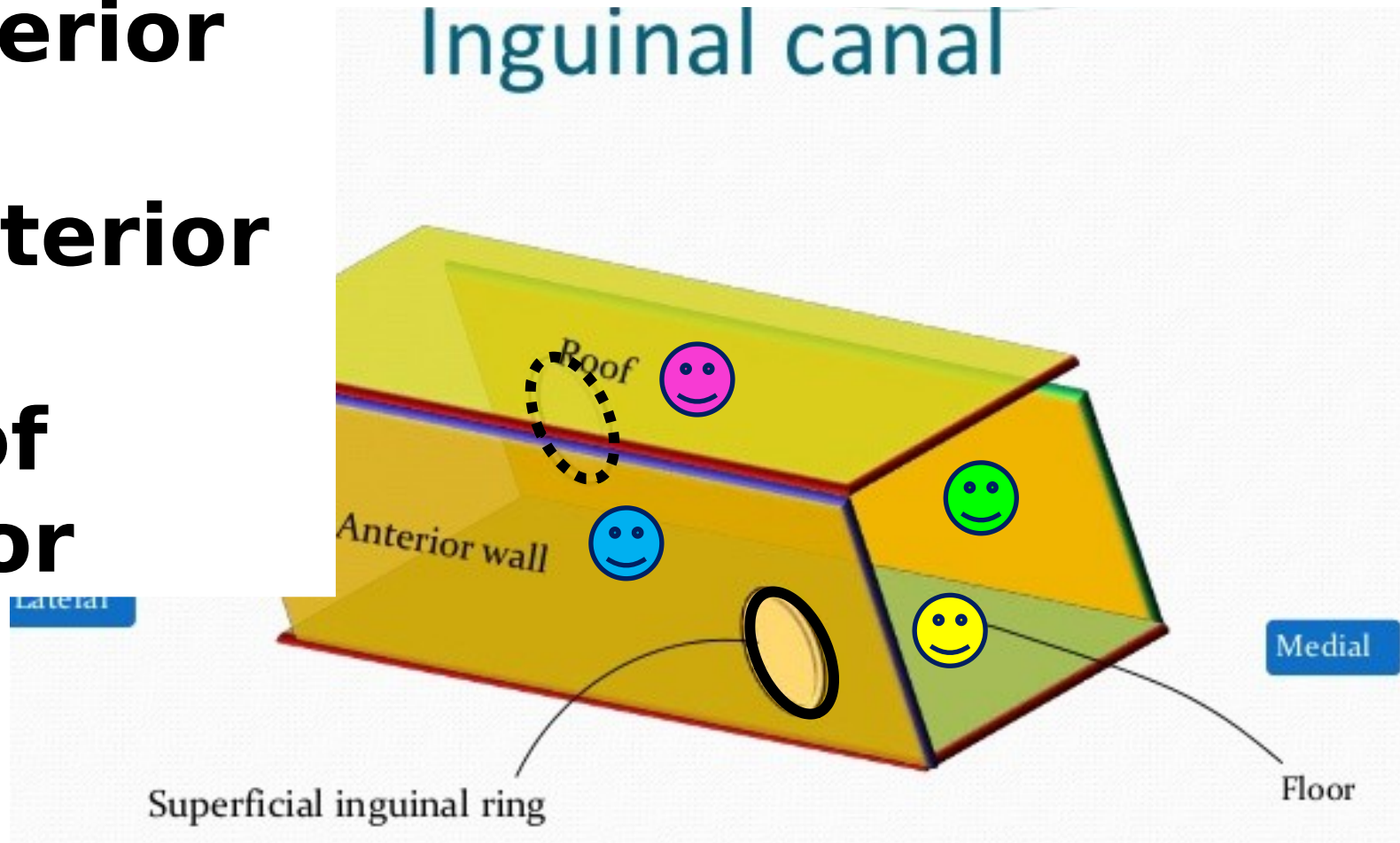
# Superficial inguinal ring:

- **Def:** Triangular opening in external oblique aponeurosis.
- **Site:** above pubic tubercle
- **Relations:**  
**Base:** pubic crest.  
**Sides:** Crura (medial & lateral) □ aponeurosis of external oblique



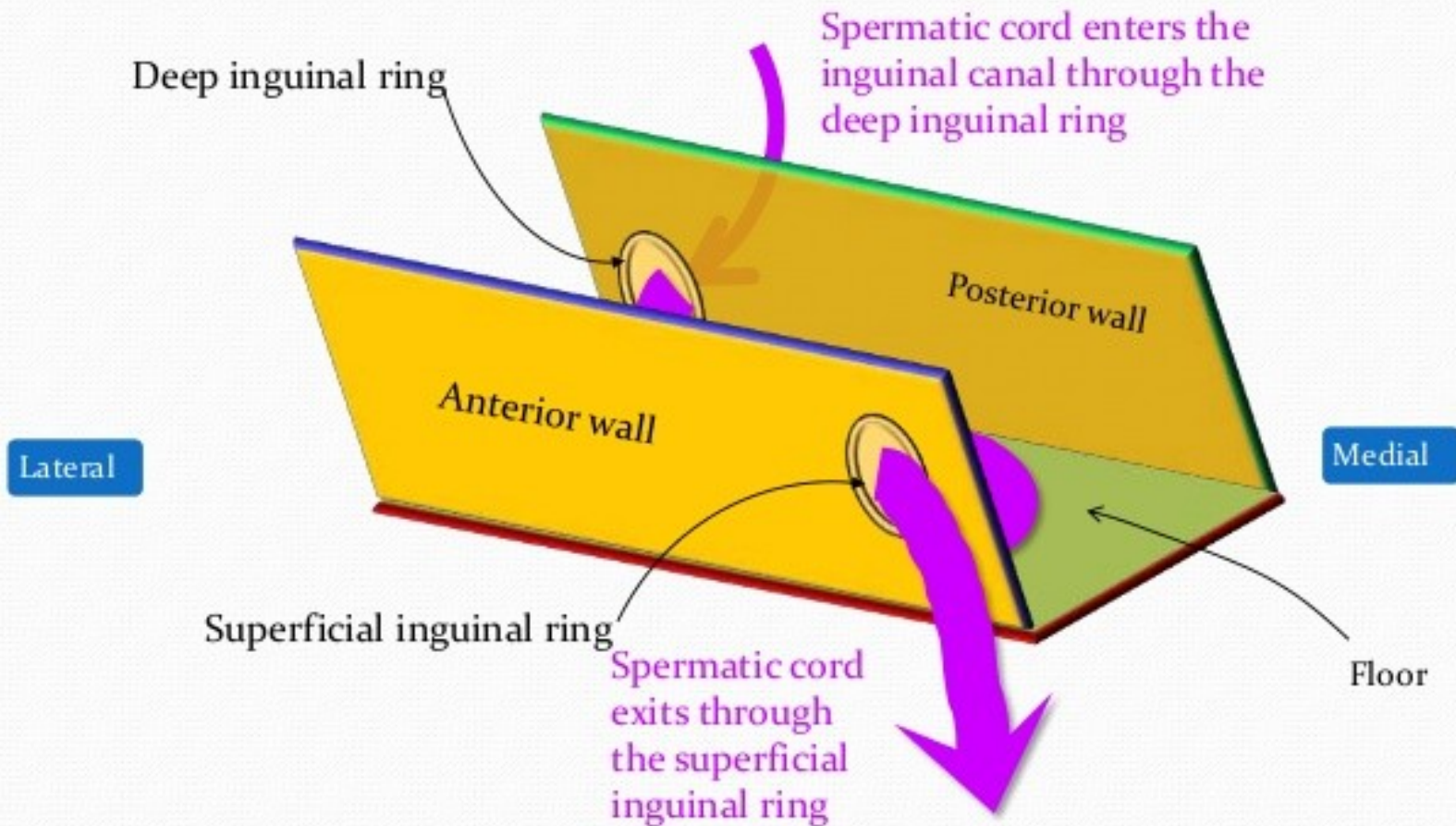
# The inguinal canal has :

- 1) Anterior wall
- 2) Posterior wall
- 3) Roof
- 4) Floor



# The inguinal canal

## Inguinal canal

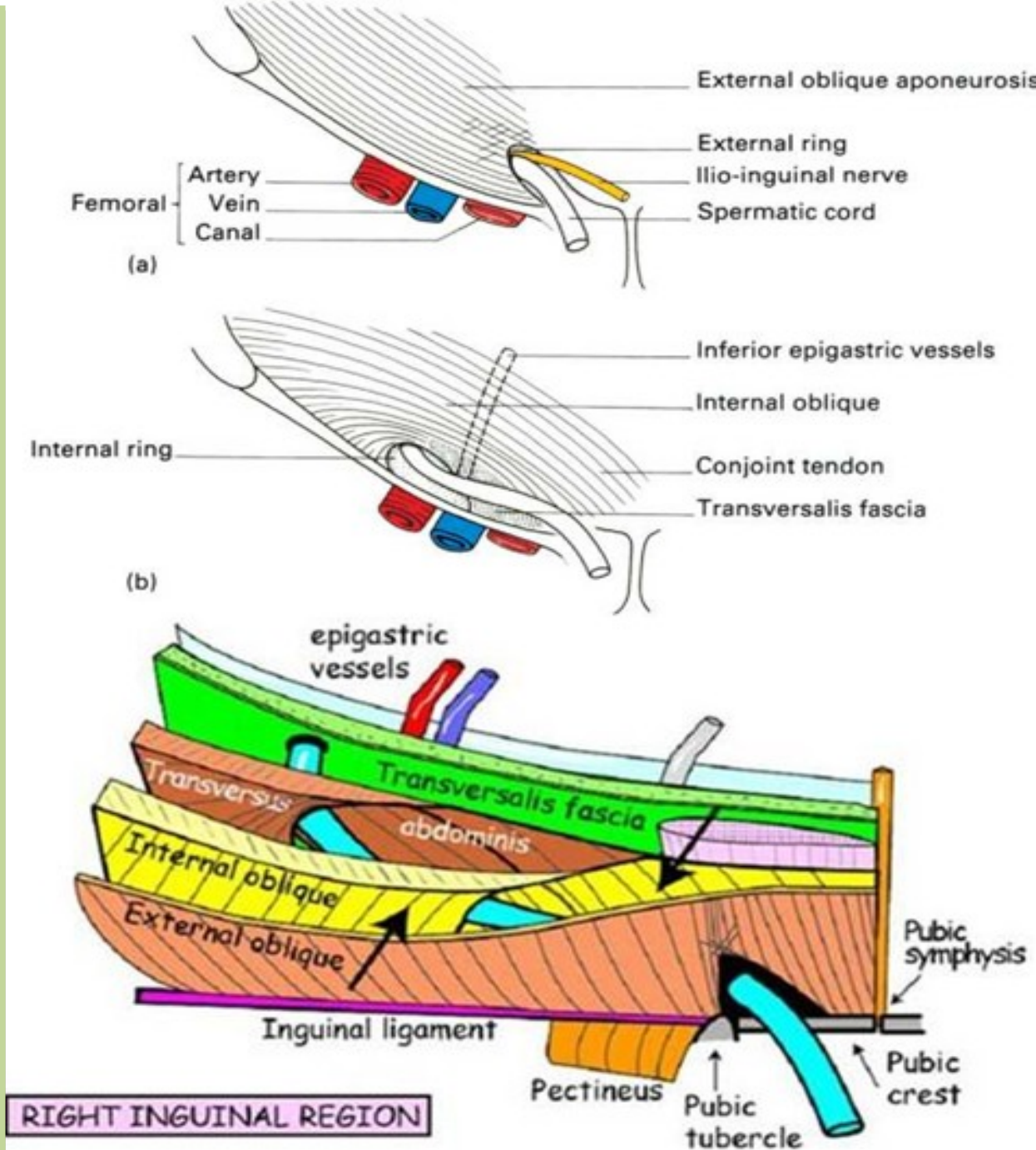


# Boundaries of inguinal canal: 2 structures in each wall

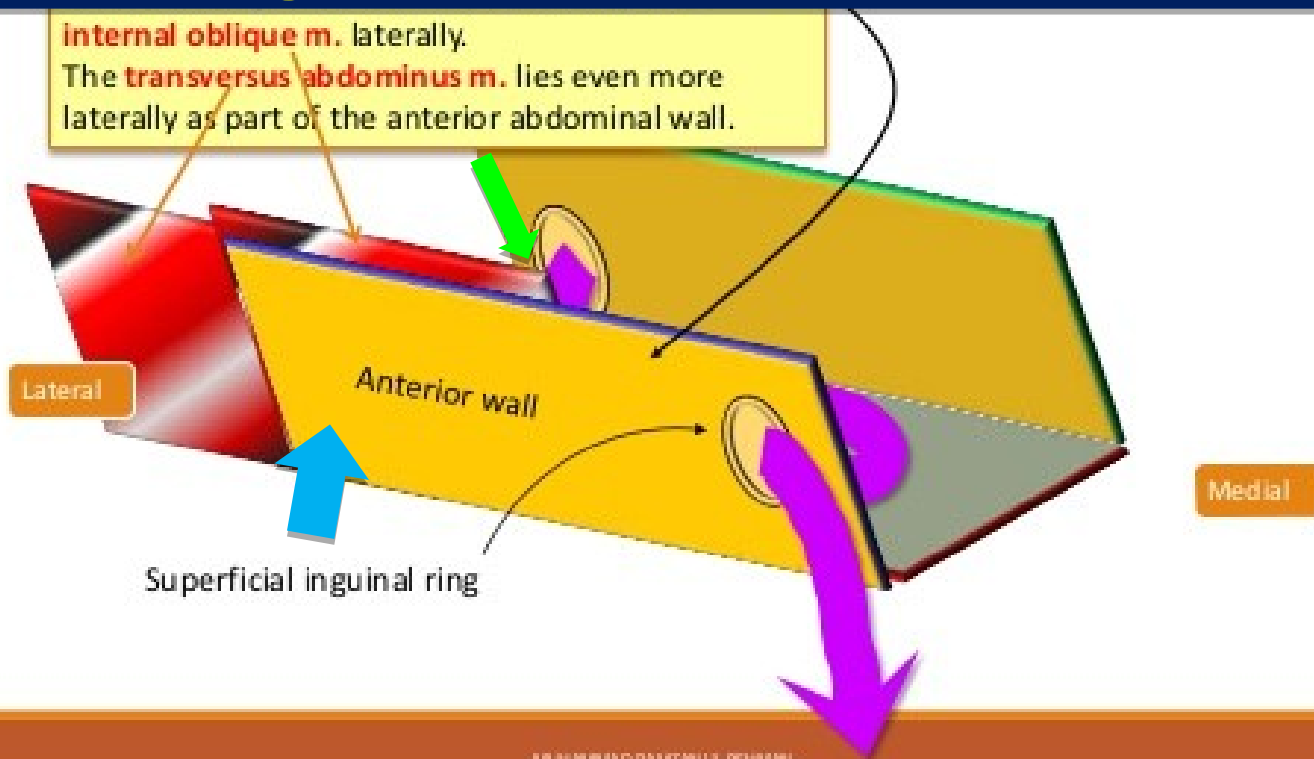
1) **Anterior wall:**  
external oblique  
along its whole  
length + internal  
oblique on lateral  
 $\frac{1}{3}$

2) **Roof:** Lower  
arching fibers of  
internal oblique &  
transversus  
abdominis  
( conjoint  
tendon )

3) **Posterior wall:**  
Fascia  
transversalis  
along its whole  
length + conjoint

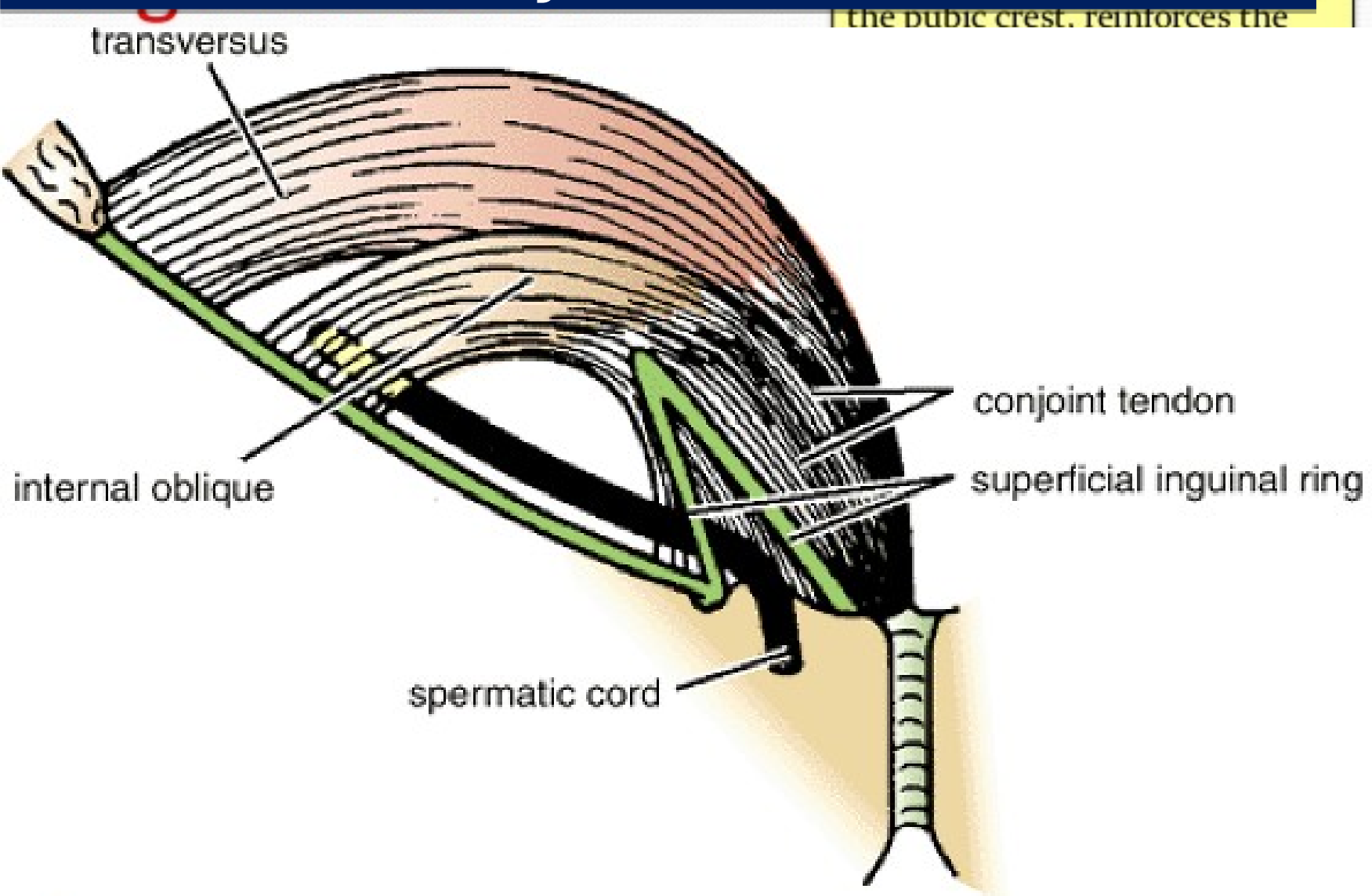


The anterior wall is weakened medially by the presence of the **superficial inguinal ring**.

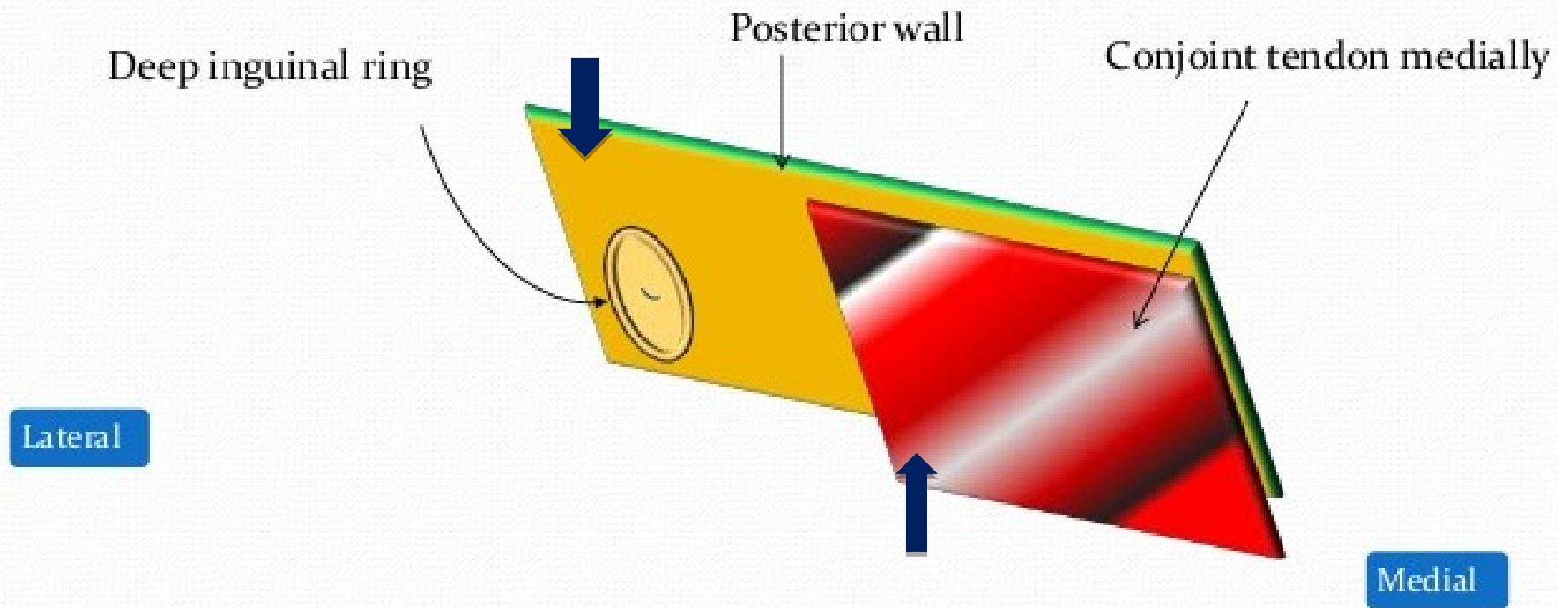


**Anterior wall:** along the whole length □  
aponeurosis of external oblique + on lateral  
 $\frac{1}{3}$  □ fleshy fibers of internal oblique

# Roof is formed by arching fibers of internal oblique and transversus abdominis ( conjoint tendon )



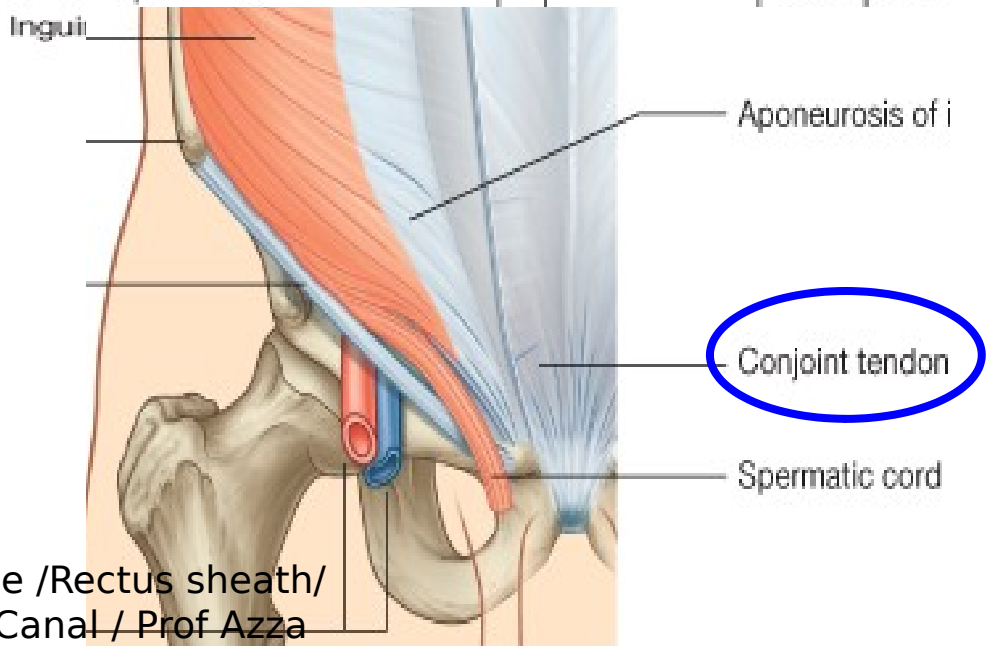
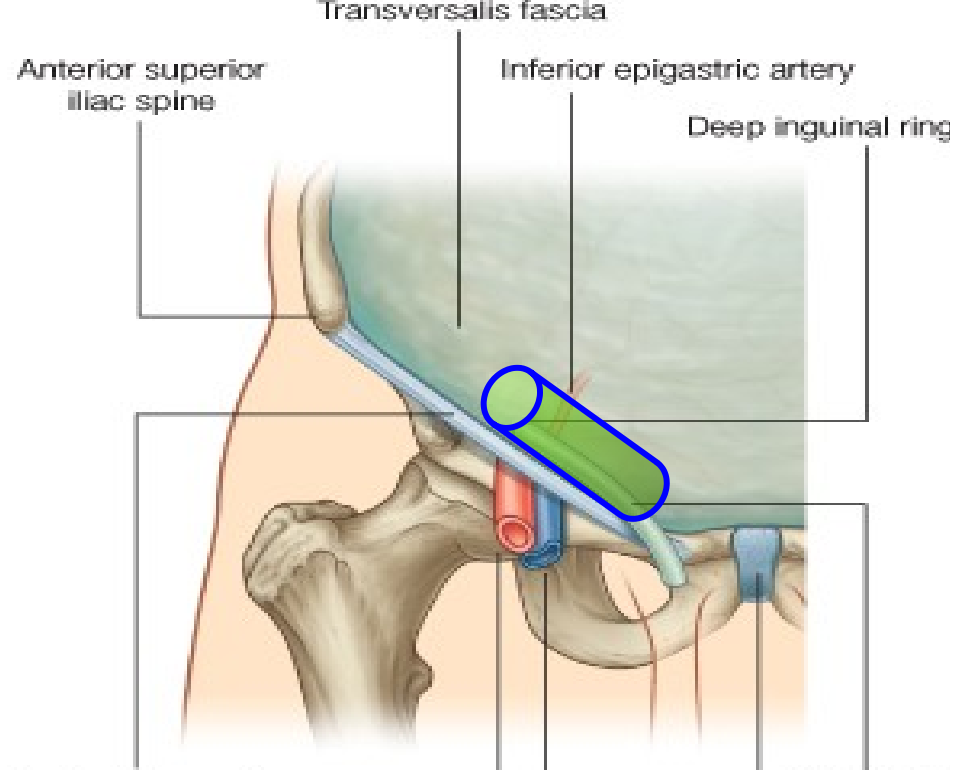
# Posterior wall of the inguinal canal



The posterior wall is formed by transversalis fascia (orange) throughout and the conjoint tendon (red) medially. The wall is particularly weak over the deep inguinal ring

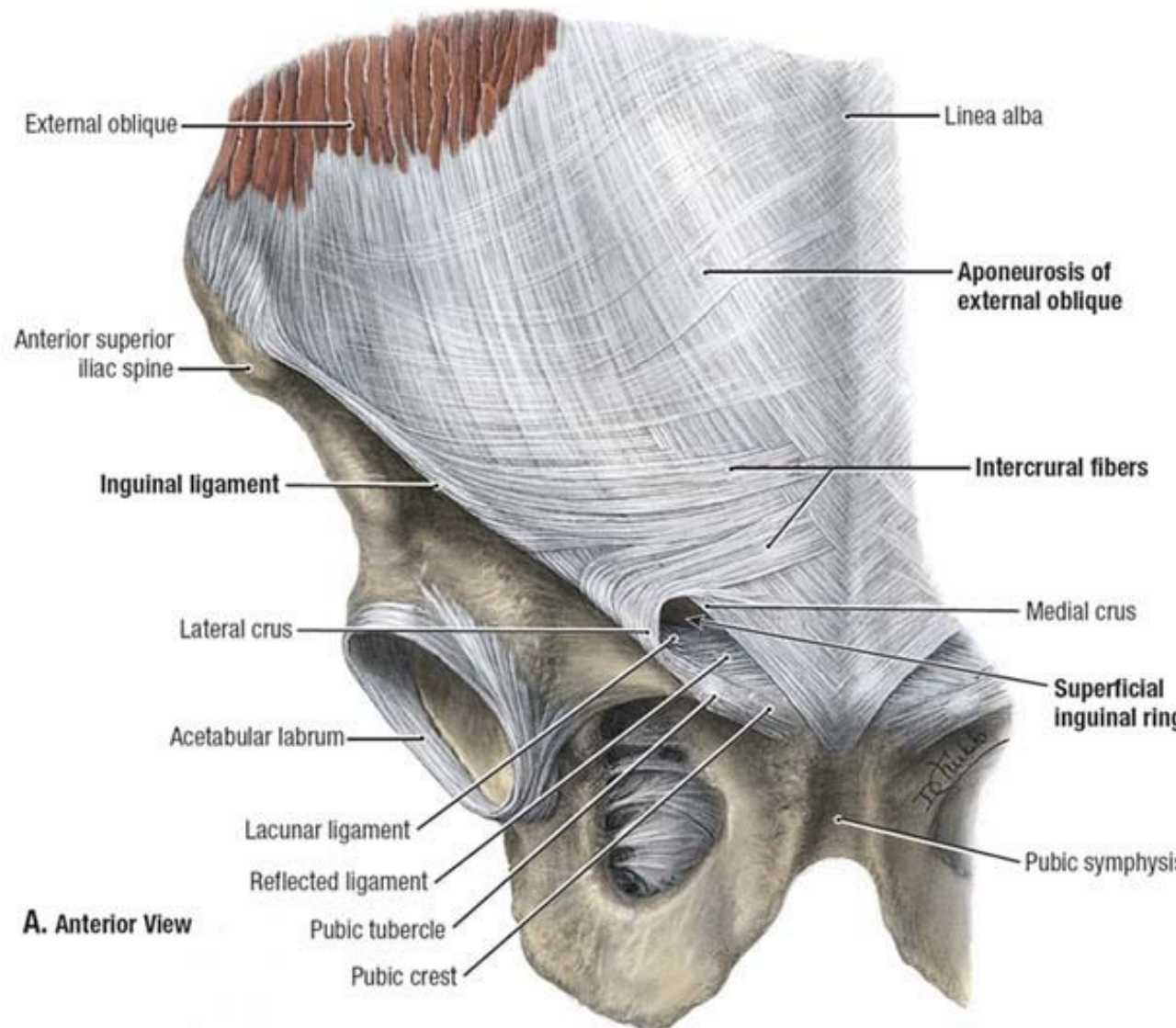
# Posterior wall

- The entire length of the canal by **the fascia transversalis.**
- It is reinforced along its medial one-third by **the conjoint tendon**
- The position of the conjoint tendon posterior to the superficial inguinal ring provides support to a potential point of weakness in the anterior



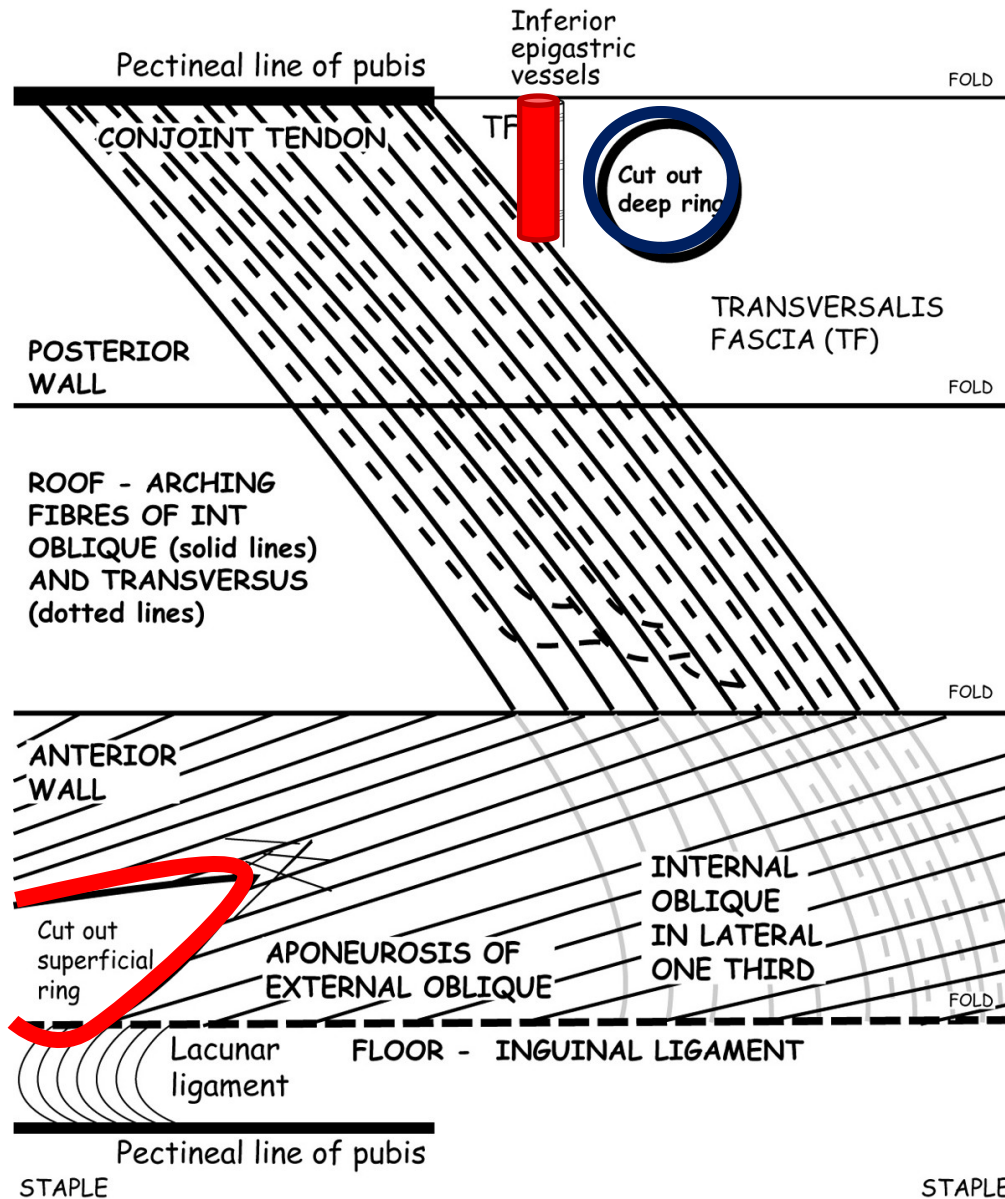
# Floor

- The floor is formed by concave upper surface of the inguinal ligament & by the lacunar ligament at its



# LEFT INGUINAL CANAL

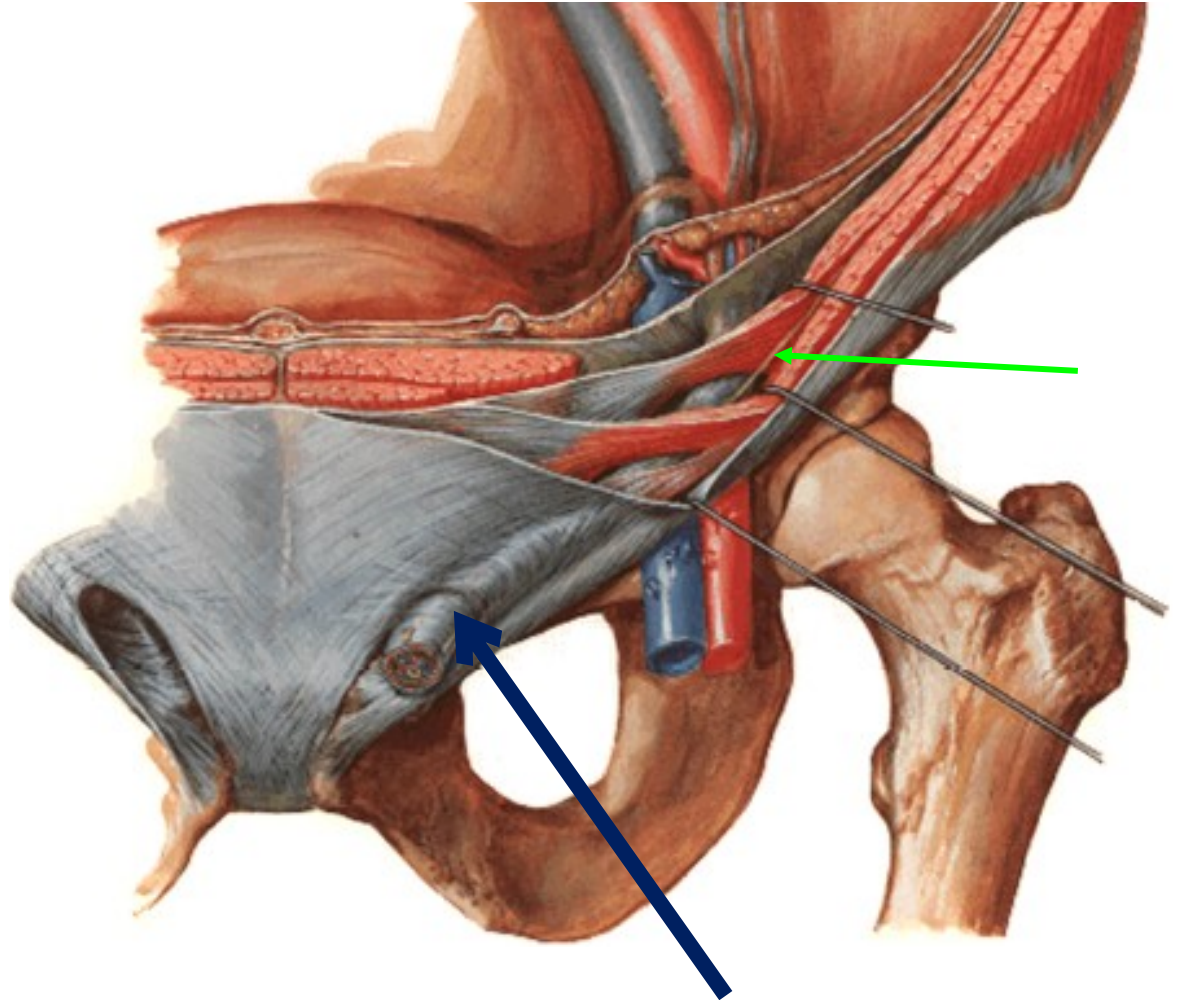
Cut out the deep and superficial inguinal rings. Fold along the four lines



# Contents

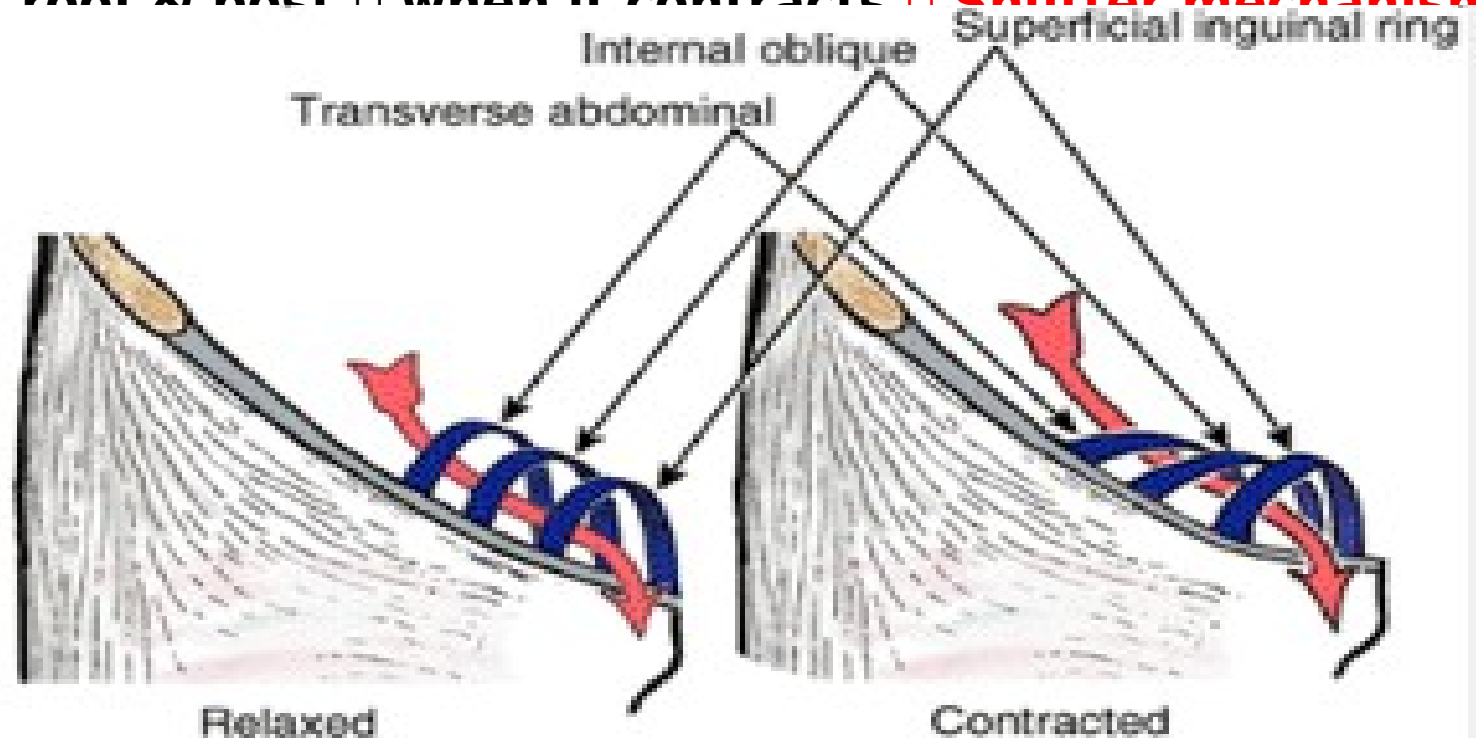
1) **The spermatic cord in males, the round ligament of the uterus in females**

2) **The ilioinguinal nerve (L1) in both males**



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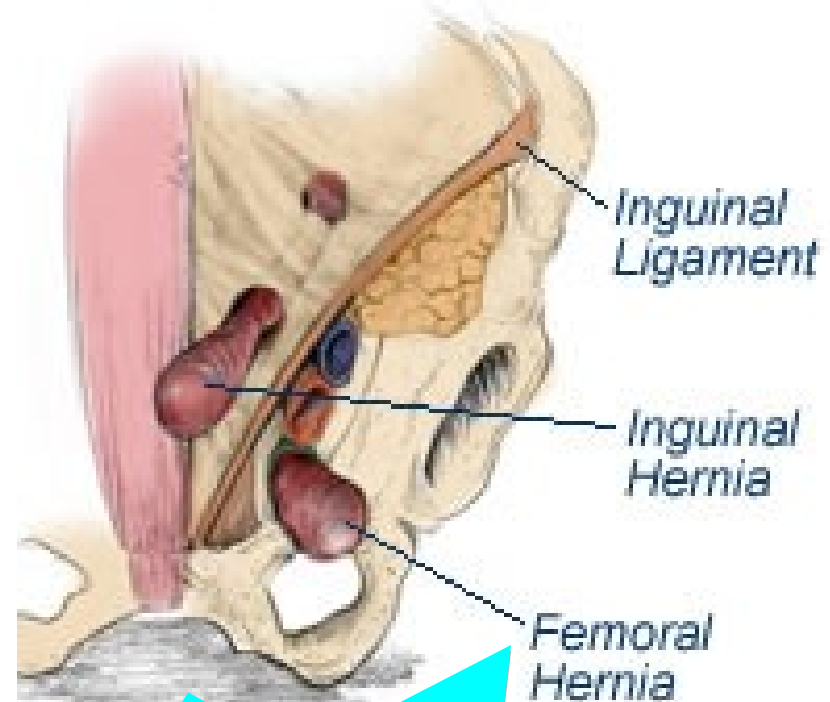
- The inguinal canal causes weakness in the anterior abd wall. Such weakness is compensated by the following:
  1. Obliquity of the canal so the 2 rings are not opposite each other.
  2. Deep ring is supported anteriorly by internal oblique.
  3. Superficial ring is supported posteriorly by the conjoint tendon.
  4. The triple relation of the of the internal oblique to the canal; ant. roof & post □ when it contracts □ **Shutter mechanism**



# Applied anatomy

## Inguinal hernia

- Hernia is the protrusion of abdominal contents (usually intestine) within a sac of peritoneum through a weak point in the abdominal wall



- **2 types:**

1. **Indirect (oblique) inguinal hernia.**

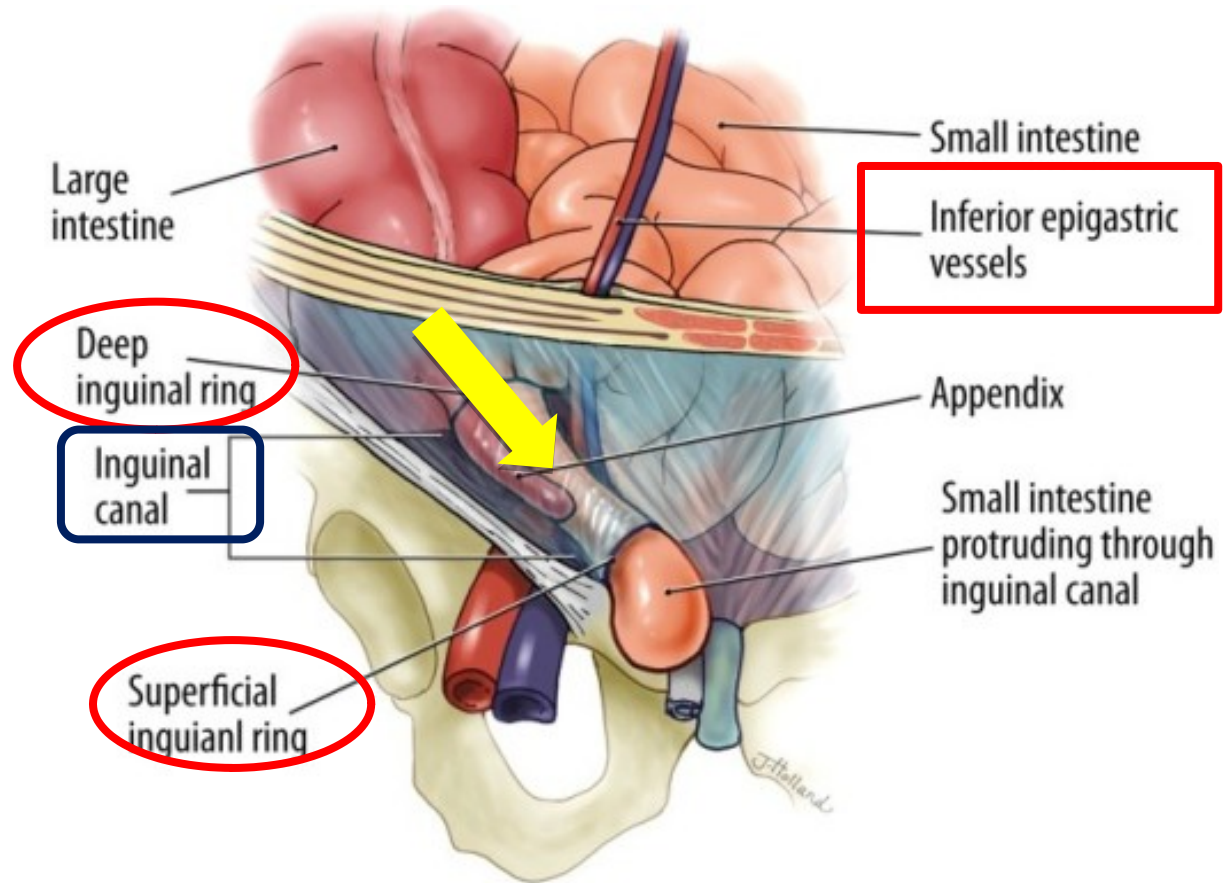
2. **Direct inguinal hernia.**

Inguinal hernias are more common in males due to the wider & well developed Inguinal canals

<b>Oblique inguinal Hernia</b>	<b>Direct inguinal Hernia</b>
<b>More frequent 80-90%</b>	<b>Less frequent 10-20%</b>
<b>Usually congenital (infants &amp; young adults)</b>	<b>In old age (over 50 yrs)</b>
<b>Usually unilateral</b>	<b>Usually bilateral</b>
<b>Bulges through deep inguinal ring → scrotum</b>	<b>Bulges through inguinal triangle → doesn't reach scrotum</b>
<b>Neck of hernia sac is lateral to inferior epigastric vessels</b>	<b>Neck of hernia sac is medial to inferior epigastric vessels</b>
<b>Line of descent is downwards &amp; medially</b>	<b>Line of descent is directly forward through posterior wall of inguinal triangle</b>
<b>Commonly obstructed (strangulated) at deep inguinal ring</b>	<b>Rarely obstructed as it has a wider neck</b>

# Indirect (oblique) inguinal hernia

- Herniation starts at deep inguinal ring, along the canal to the superficial inguinal ring.
- Arises lateral to the inferior

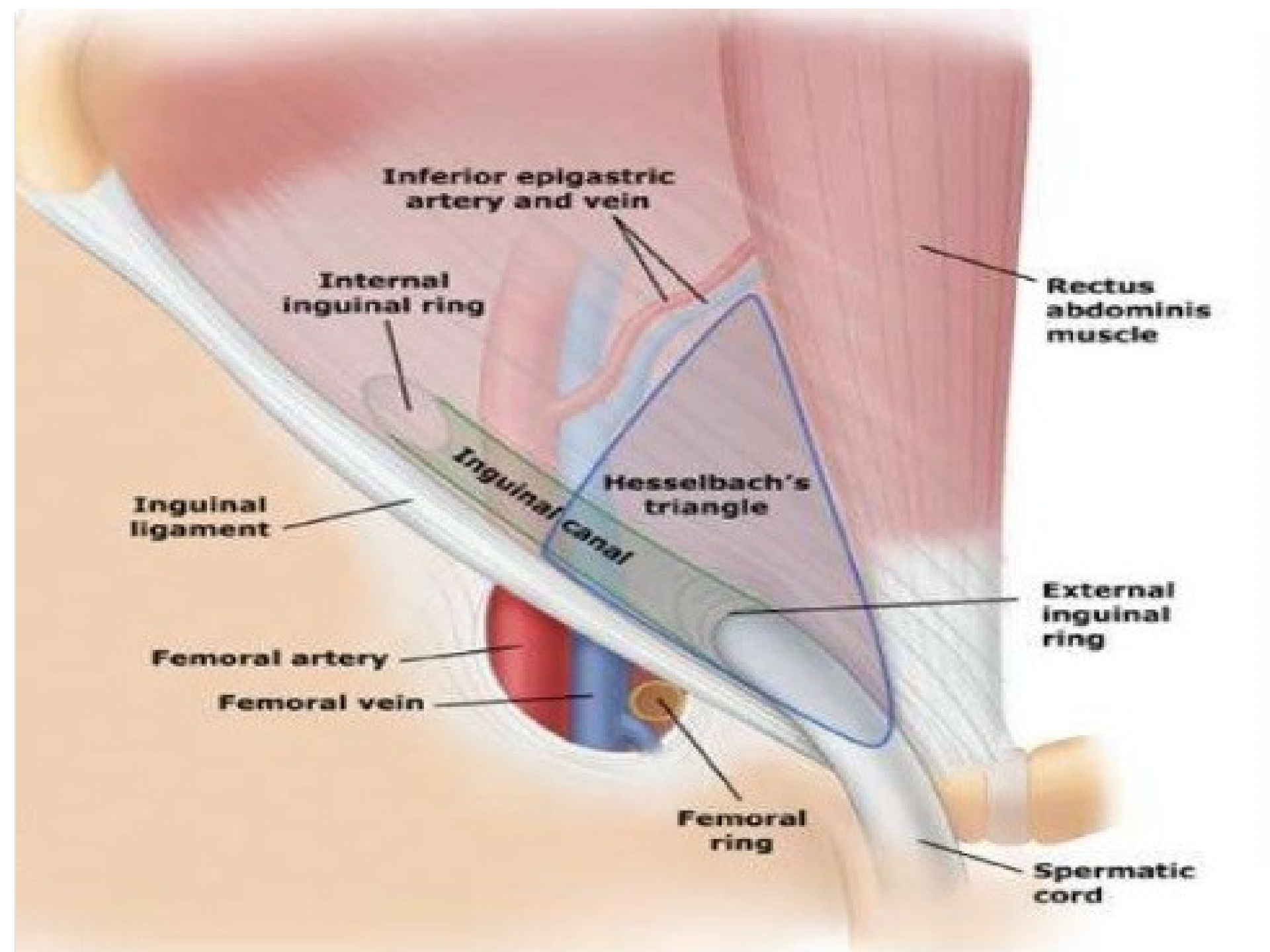


# Direct inguinal hernia

- Hernia pushes directly forward through the posterior wall of the inguinal canal i.e through the inguinal ▲  
{Hasselbach's triangle} Arises medial to the inferior epigastric artery
- Usually doesn't descend to the scrotum.
- To differentiate between direct &



Direct inguinal



# Quiz

**Which of the following structures forms the floor of the inguinal canal?**

- A. Fascia transversalis
- B. Conjoint tendon
- C. Reflected part of the inguinal ligament
- D. External oblique aponeurosis
- E. Inguinal ligament

# Quiz

**The deep inguinal ring is a hole in which of the following structures?**

- A. External oblique aponeurosis
- B. Internal oblique aponeurosis
- C. Transversus abdominis aponeurosis
- D. Fascia transversalis
- E. Extraperitoneal fatty tissue



# The End

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